Aerotriangulation.

By E. R Krahmer

IT is well known that by employing aero-photogrammetric methods and instruments one is able to produce maps in considerably shorter time and at much lower cost than is possible when the work is done according to the old terrestrial methods This saving of time and money will, however, vary according to whether a sufficiency of terrestrial bases is already known or not For it is, indeed, a fact that in the hitherto practised aero-photogrammetric methods most of the time was spent in finding at least three fixed points for every plate-pair which were necessary to make an exact setting into the plotting instrument possible If such terrestrial measurements have to be carried out in difficult country, for instance in primeval forest areas or extensive swamps, it cannot but happen that the expenditure of time and money will be so greatly augmented that in the end the whole advantage of aerial survey becomes illusory For that reason it is evident that science must seek ways and means to eliminate the necessity for such terrestrial work as much as possible The ideal condition would naturally be, that one could do without any fixed points on the ground whatever This ideal can, however, never be practically realized At least a few terrestrial fixed points will be always needed in order that by their means the aerial photos can be set into the plotting instrument and in order to obtain a basis for the scale and the elevations above sea level

A considerable advance in this line has been made by the most recent plotting instrument for photogrammetric survey, the Aerocartograph (Fig 1) This instrument was constructed by the well-known Professor of Geodesy, R Hugershoff, Dr Ing , Dresden, on the principles underlying his Autocartograph, and has most ingeniously reduced the necessity for terrestrial work to a minimum

The plotting of a map in the Aerocartograph is carried out in the manner that all details of two overlapping measuring-photos are, according to the methods of intersection and with the help of a double telescope and a drawing system connected with the same automatically, transferred to the map-surface by the draughtsman manipulating the plotting apparatus When the first two plates I and II have been plotted (Fig 2), plate I is removed from the left photo carrier A and in its place II inserted , in the place of plate II a new plate III is inserted in the photo carrier B In other words, a new setting of the plate-pair II/III must now take place , after this plate-pair has been plotted the new setting of the plate-pair III/IV must follow etc If one, therefore, desires to produce a really perfect map, it is necessary to furnish, if possible, three fixed points for every plate-pair of this kind, in order to eliminate the errors occurring at every new setting

Theoretically speaking, one could, of course, do without terrestrial fixed points for the further plate-pairs, for one is able, for instance, after the plotting of the plate-pair I/II to read the elements of the plate II from the photo-carrier B and to bring them again to the identical position in the photo-carrier A It would only

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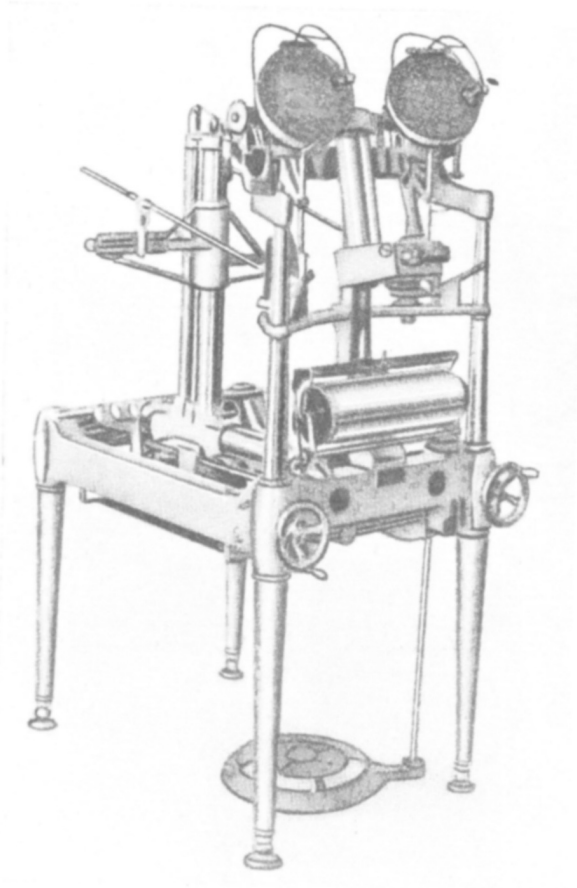
be stereoscopically to set plate III, accordingly a new orientation by means of new terrestrially measured fixed points would be superfluous In place of it one could take any points from the already orientated plate-pair and use them for the orientation of the following plates In other words one would thus secure an aerotriangulation In practice, however, a method like this could not be used with the hitherto employed plotting instruments, as errors occurring here could not be avoided



Professor Hugershoff has now found a practical solution of this question and has applied it in the construction of his Aerocartograph The working method for this instrument is as follows

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After plotting the plate-pair I/II plate I is removed from the photo-carrier A and replaced by plate III, while plate II remains in the photo-carrier B By means of a lever the stereo-effect is then reversed, so that now the left eye observes plate II held by the right photo-carrier and the right eye plate III held by the left photo-carrier (see Fig 3) Simultaneously with this reversion of the stereo-effect the reversion of the basis is effected Now nothing further is necessary but to set plate III, without using any points whatever, but only stereoscopically, according to plate II which is already orientated towards the horizon

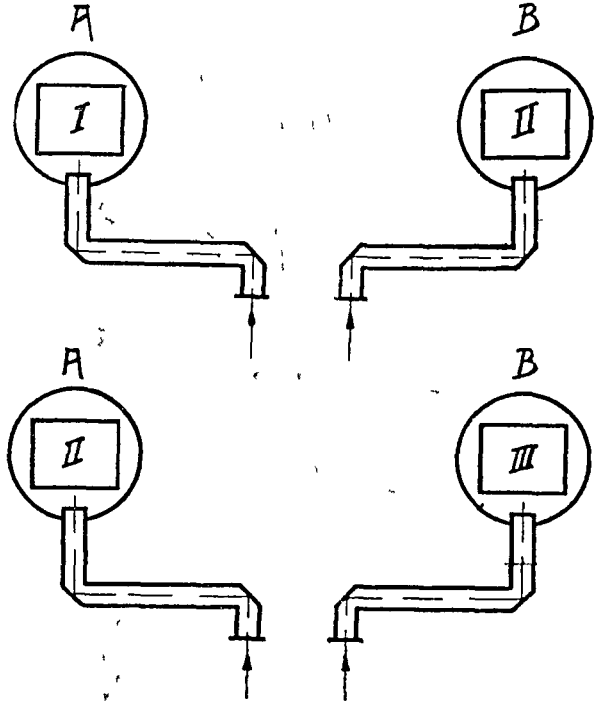

Fig 1

Thus the practical application of the method is made possible Notwithstanding, one cannot entirely miss fixed points on the ground, but, as mentioned above, must in practice measure controlling points for every 75 to 150 miles, in order

to recognize and counteract the influence of possible causes for error, which, however as shown above, have been restricted to a minimum

Constructively Prof Hugershoff has solved the problem of the reversion of the stereo-effect by means of mounting a shiftable prism arrangement within the ray-track of the double telescope The shifting of the prisms 1 and 2 is accomplished by manipulating a lever 3 (Fig 3)

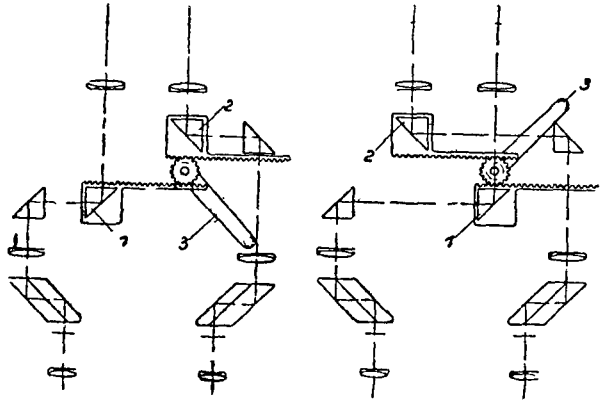

Fig. III

This appliance has the additional advantage of considerably augmenting the working speed in the plotting of the photograms, as the work of setting the photo-pairs, which occupies so much time, is greatly diminished The greatest importance of this new construction by Hugershoff, however, lies in the extraordinary diminution of the terrestrial work and in the simplification, acceleration and cost-reduction connected with it

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